

MODIS Team Meeting Minutes

Minutes of the MODIS Team Meeting held on Tuesday February 8, 1994.

Action Items:

73. Complete the MODIS brochure and released for printing. Assigned to Bauernschub 10/18/93. Due 11/15/93.
74. Prepare and submit a Configuration Change Request which revises the definition and impact of levels of software criticality for the MODIS Software Management Requirements Document. Assigned to Anderson 10/26/93. Due 12/ 1/93
75. Determine if the four electronic module boxes can be individually thermal tested in air, or must the thermal testing be done in a vacuum. Assigned to Silva 10/26/93. Due 11/ 9/93

The following items were distributed:

- 1) Weekly Status Report #124
- 2) SBRC Memos submission from week #116
- 3) Minutes of the previous team meeting

Attendees:

Dick Weber	Bruce Guenther	June Tveekrem
✓ John Bauernschub	✓ George Daelemans	✓ Bob Martineau
Rosemary Vail	John Barker	✓ Bob Silva
Lisa Shears	Joann Harnden	Ken Brown
✓ Mike Roberto	Patricia Weir	Robert Kiwak
Nelson Ferragut	✓ Mitch Davis	Harvey Safren
✓ Gene Waluschka	Jack Ellis	✓ Ed Knight
Kate Forrest	Ken Anderson	✓ Harry Montgomery
✓ Bill Barnes	✓ Rick Sabatino	✓ Marvin Maxwell
Les Thompson	✓ Cherie Congedo	✓ Bill Mocarsky

MODIS Team Meeting and Other Topics 8 February 94

General

Comments on MODIS CDR are due now !

Focal Plane Assemblies

Bob Martineau mentioned that SBRC will buildup 3 FDA (fanout detector assembly -S/MWIR) mockups with large die and three with subarrays. A spare S/MWIR SCA on 50 mil sapphire substrate (which has subarrays) will be temperature cycled 100 times. The same should be tried with LWIR SCAs.

Jim Woolaway has delivered ROIC test structure tape to Orbit. Orbit is making masks. Process control monitors will be in test in 6 weeks.

W1 protoflight detector cables (for PV detectors) are due the end of February from Graphic Research.

Pete Jamerson documented results in a telemail message dated February 5th at 6:26 PM EST. The following includes excerpts from Pete's message:

A readout integrated circuit (ROIC) status meeting was held at Carlsbad on February 4th. Carlsbad is doing well on lot#3. All functional tests look good so far. Lot#3 so far does not have the current leakage problem of lot#2. The 4 device types on one wafer had the following yields: SWIR 38% acceptable, LWIR 50%, NIR 42%, and VIS 38%.

Lot#2 ROIC cross-sections performed by Turner showed a problem with one contact metal strip coverage (SBRC and Carlsbad believe this may have been a random event or due to Turner's method of cross-sectioning). The remainder of the photographs show normal Carlsbad processing. However, SBRC's interpretation of contact metal stop coverage may require a waiver.

Projected yields of ROIC lots 3, 4, and 5 are expected to satisfy MODIS requirements including spares.

Optics

Gene Waluschka believes we need to be assured the scan mirror will operate in our orbit radiation environment (consider the South Atlantic Anomaly or horns or the Van Allen belts as well as total dose). If there is not definitive proof we are okay, then we should demonstrate with an operating motor/encoder at NRAD. However, the motor/encoder is now being installed so there would be a schedule hit.

Gene talked to Pete Chase of SMI on February 9th who said the LED and photo diode are non standard parts and will be radiation tested by an independent lab. The B270 Schott glass will not be tested but is high in SiO₂ which is radiation resistant. Any radiation testing of the LED and photo diode should also check for single event upsets such as might occur in the SAA.

Our optical contractor from Swales, Qian Gong has completed a tolerance analysis of MODIS (positional sensitivities).

Gene Waluschka has started looking into stray light analysis of scan cavity. This will also include the nadir aperture doors.

Gene will check a code V model of the SRCA. This may eventually be used in a STOP analysis of the SRCA.

Thermal

George Daelemans is working on a thermal analysis to predict on orbit operational temperatures within the SRCA.

George has offered the total hemispherical facility in building 86 for emissivity measurements of MODIS radiative cooler parts. This should help with the refining of cooler temperature predicts

The heating effects on the radiative cooler if the spacecraft is maneuvered for a lunar MODIS calibration is on the back burner.

George has completed the orbital transient thermal cases for the STOP analysis.

Electronics

Mitch Davis has looked through 170 to 200 pages of schematics to trace the MODIS signal from each type of detector to the digital work which goes to the spacecraft.

During the afternoon of February 8th, Mitch met with Bob Joyce and showed Bob the path of each type of detector signal through MODIS. On the basis of this meeting, Mitch is preparing a couple of action items.

Systems Engineering and Calibration

Bill Barnes mentioned that the MODIS memos are on MODARC. This is a system that was set up by John Barker and others which has all the MODIS memos and allows searches based on key words. Mike Heaney of the MODIS Administrative Support Team (MAST), x-4044, is the person to contact for MODARC. Mike has a user's manual as well as information on accessing the program.

Bill mentioned that the current estimate for the aperture door is 110 degrees C. Tom Pagano will be looking into whether or not the door will be seen in the MODIS data. GSFC plans an independent look.

For the ROICs, Tom is concerned that there may be a need to calibrate for both the primary and redundant bias.

SBRC is considering an outdoor solar calibration. There will be discussions with GSFC on this.

Tom believes that scatter off the scan mirror may be as significant as ghosting or detector crosstalk for MODIS.

Ed Knight has looked at the band 32 data from NRAD. This looks okay. The edge range on band 9 is out. This will need to be brought within spec or a waiver will be needed.

Ed was concerned about the MODIS Ground Based Calibrator (MGBC) making measurements down to about 380 nm since our instrument range goes down to 400 nm. Jim Young says we can get to 380 nm or below that with the MGBC.

Ed talked with SBRC about the data sets for the MODIS Systems Analysis Program (MSAP). The data for the detector responses and dichroics are measured, half the filter data are measured data, and the optics and coatings are modeled.

Mechanics

A meeting on the kinematic mounts was held on February 7th. Attendees included Nelson Ferragut, Tom Venator, Bill Case, Cherie Congedo, Ralph Mollerick, and Ken Hinkle. The decision was made to have Jim Mayor of Swales review the MMAS stress analysis report on the failed KM-2. Nelson has raised the issue that if there is a failure of the MODIS bracket and a kinematic mount, there could be a question of which item caused the failure. Nelson considers the possibility that MODIS should build its own mounts.

Nelson discussed the MMAS KM#2 failure report (EOS_STR-378 dated 1/21/94) in a telemail message dated February 1st. Nelson added stress concentration curves to this message. Nelson concluded that there were different points of view and a full assessment of the current situation was needed. The evaluation should consider all kinematic mounts.

Mark Clark and S. Raymus of MMAS responded to a fax from Tom Venator which contained comments from Dick Weber and Jack Brooks on February 7th. Some of the high points from the memo:

- 1) Crack started in the larger section below the bearing seat which has a radius of 0.030 inches.
- 2) The 0.005 maximum radius assured the bearing would seat properly. A radius undercut at the root of the bearing journal was considered but the resulting net section stress was not acceptable. Increasing the journal diameter was not compatible with mount volume constraints. MMC will specify a minimum radius.
- 3) Typical spacecraft structure and appropriate verification testing sees well below 1000 fully reversible cycles at maximum loading which is typically considered to be static loading. Standard practice throughout industry (aerospace and otherwise) for ductile materials is to not use stress concentration factors for static loading. MMAS uses a couple of references to backup the previous statement, although one of those references hedges by stating "...The practical significance of stress concentration therefore depends on circumstances. For ductile metal under static loading it is usually (though not always) of little

importance;..." Titanium 6AL-4V (annealed) is a standard aerospace material with an elongation of 10%. It is therefore considered a ductile metal.

4) skipped here

5) The lateral and axial loads were reversed in the analysis, but only on the seven pages of sample calculations provided with the memo. All the fatigue calculations and all the basic stress analysis was performed using the correct loads.

6) and 7) skipped here

8) The grain structure in the material has the wrong orientation. MMAS will take an action item to verify the grain on the failed part was in fact transverse to the load direction.

Even considering the above, it seems we could be getting close to being marginal with the current kinematic mount design. A few vibration tests requiring repeats could put us dangerously close to not having static loading. The quote in number 3, above, could be restated that there are occasions when stress concentration factors are important even for static loading of ductile metal. The kinematic mounts should not be a source of concern. This matter should be resolved on technical merit. But, unless there is an informed technical consensus by SBRC, GSFC, and MMAS structural engineers, we should err on the conservative side.

Quality Assurance

Bob Silva mentioned that one or more ROICs are at GSFC for destructive analysis. Code 300 is still waiting for the report from Turner Engineering.

ESD testing is complete on PC detectors. There ESD sensitivity has been established.

SBRC is still looking into the possible use of engineering model detectors for flight. At issue is the study of an SBRC QA heritage report on the EM detectors.

GSFC is reviewing SBRC's failure reporting system to see if we are in agreement with their approach.

FMEA inputs have been provided to Bob from Mitch Davis, Bob Martineau, Gene Waluschka, and Mike Roberto.

Testing of Electronics Boxes in Thermal Vacuum

At this time, we are interested to see if Dick Julian is in agreement with George Daelemans' telemail write-up of the thermal portion of our verbal discussions. One addition to the GSFC list by Bob Silva is that we recommend that at least one set of flight model electronics boxes would need to be tested in thermal vacuum. Resolution is expected after Julian returns from his trip to Plessy in England.

Software

The GSE software acceptance reviews will be in May.

An OASIS training and working group meeting will be held at Omitron and GSFC March 8th through 11th.

Twelve flight and GSE software CDRLs which were due at CDR are in and being reviewed.

STOP Analysis

Cherie Congedo stated that STOP analysis results using a NASTRAN model she and Wayne Pierre of SBRC are in agreement on should be available by the end of this week. Cherie will consider the change from the cold alignment of the cold focal planes with the bench test cooler to on orbit operations.

Mike Roberto February 10, 1994